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NOTES, ABSTRACTS, AND REVIEWS.

THE CLASH OF THE TRADES IN THE PACIFIC.

By C. E. P. BROOKS and H. W. BRABY.

[Abstracted [1] from Quarterly Journal of the Royal Meteorological Society, Vol. XLVII, No. 197, January, 1921.]

The area considered lies between latitudes 5° S. and 12° N. and between longitudes 150° W. and 150° E. Regular observations were taken at several small islands and, in this study, were supplemented by mean values for the open ocean, published on the pilot charts of the United States Hydrographic Office. The discussion is based principally upon conditions prevailing during the period January to June. East of 180° longitude the Trades meet at a small angle and moderate rainfall occurs. Most of this rain falls with a NE. wind; the explanation seems to be that the SE. Trade, being warmer, rises over the NE. Trade. [Query: Does this SE. Trade continue northward as the antitrade?] Occasionally rain occurs with a westerly wind. The reason for this is not clear, but the authors suggest that the westerly winds may be produced by eddies and are therefore local in character. West of 180° longitude the Trades meet at a large angle, almost at right angles, in fact. They do not differ materially in density and therefore mix and form a great mass of rising air. As a result heavy rainfall occurs, much heavier than farther east. The belt along which the Trades meet is of course one of low pressure, with lowest values in the west, where the angle between the two wind systems is large. The exact location of the lowest pressure varies, and it is found that the amount of rainfall is closely associated with the movements of this "mobile center of action." When it is located well to the west, dry weather results; when it moves eastward, increasing rain occurs.

In an addendum the authors point out the parallelism between the "Equatorial Front," formed by the meeting of the Trades, and Bjerknes's "Polar Front," but remark that the former never has the wavy form or the undulating motion, both of which are characteristic of the latter.—*W. R. G.*

[1] For other abstracts see *Nature* (London), Nov. 25, 1920, p. 425; *Meteorological Mag.*, December, 1920, p. 248.

RECOVERY OF SOUNDING BALLOONS AT SEA.

The recent addresses of His Serene Highness, Albert I, Prince of Monaco, before the American Geographical Society in New York City and the National Academy of Sciences in Washington, in which he discussed the aerial soundings made from his yacht, the *Princesse Alice*, recall the interesting methods employed in recovering the instruments which have ascended to high altitudes and descended again to the surface of the sea. The methods employed in making sounding-balloon ascents at sea consist essentially in sending aloft two balloons in tandem, one more fully inflated than the other. Below hangs the meteorograph and below that a float which, upon returning to the surface, acts in conjunction with the balloon, to keep the instruments above the water and to signal the location of the apparatus. The more fully inflated balloon bursts, thus allowing the other balloon, instruments, and float to descend to the surface of the sea. But how is the location of the apparatus to be determined?

This question was answered in a simple and quite satisfactory manner by Ensign Sauerwein of the *Princesse Alice*.[1] By charting the course of the ship upon the map, and by noting with a theodolite the altitude and azimuth of the balloon, it was possible to determine with precision the distance from the ship of a vertical dropped from the point where one of the balloons burst. In order to ascertain the point where the other balloon will reach the sea, one must know the altitude of bursting, the rate of descent, and the winds at all levels traversed. Of these three factors, the first can be computed from the rate of ascent of the balloon, a matter to be determined by experiment, and the time of bursting can be observed through the theodolite; the rate of descent can be quite accurately computed by knowing the weight of the apparatus and the resistance of the falling mass; the winds encountered on the descent are assumed to be the same as were encountered on the ascent, which is to say that the direction of the point where the balloon will touch the surface is in the same direction as the resultant line joining the starting and bursting points of the balloon. It should be remembered, of course, that the vessel must steam in the direction the balloon is traveling, and thus be able to retain the balloon in sight under ordinary conditions for the entire flight.

It is recognized that this is only an approximation, but the objections which can be raised against it on such a score are answered by the significant fact that the scheme works, and has been successfully employed by the investigators above mentioned. Cloudiness, obviously, introduces difficulties. The balloon when riding above the waves is a conspicuous object, for it usually stands from 100 to 150 meters above the surface and is painted a conspicuous color, thus rendering it visible for many miles. De Bort remarks that in general the above method was sufficiently accurate to bring the ship within 7 or 8 miles of the point of descent, a limit within which the balloon was easily visible. It was only necessary upon sighting the balloon to steam toward it and, with a specially prepared hook, catch hold of the light cord and draw the apparatus aboard the vessel.—*C. Le Roy Meisinger.*

[1] S. A. S. le Prince de Monaco: Sur les lancements de ballons sondes et de ballons pilotes au-dessus des océans. *Comptes Rendus*, Sept. 11, 1905, pp. 492–493. This method of recovering balloons at sea was also used about the same time by Teisserenc de Bort and Lawrence Rotch. Cf. Étude de l'atmosphère marine par sondages aériens Atlantique moyen et région intertropicale. *Travaux Scientifiques de l'Observatoire de Météorologie Dynamique de Trappes*, Paris, 1909, pp. 49–50.

SIMULTANEOUS VARIATIONS OF TEMPERATURE AND WIND SPEED ON THE EIFFEL TOWER.[1]

By R. DONGIER.

[Abstracted from *Comptes Rendus* (Paris Acad.), Mar. 14, 1921, pp. 699–701.]

By an analysis of the temperature and wind observations made at the several stages of Eiffel Tower and at the Bureau Central, it is found that there are times when there are very rapid successive fluctuations of temperature at the top of the tower accompanied by similar fluctuations of wind speed. The wind suddenly increases from gentle to almost squall force, there is a drop of humidity, and the temperature fluctuates, as noted above. Upon investigation it is found that there is a cold surface layer being overridden by a warmer wind of greater force. There is no mixing of the air, but the

[1] Les oscillations simultanées de la température et du vent au sommet de la Tour Eiffel et leur relation avec la surface directrice (Bjerknes) d'une dépression.

friction at their interface produces waves which cause the fluctuations of temperature and wind speed. The drop in humidity is occasioned by the displacing of the cold air by warm.

All this is in accordance with the views of Bjerknes [2] on the passage of the "steering surface" (*surface directrice*) which occurs in the front of a cyclone.—*C. L. M.*

[2] Bjerknes, J.: Uber die Fortbewegung der Konvergenz und Divergenzlinien. *Meteorologische Zeitschrift*, 1917, pp. 10-11.

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AMOUNT AND COMPOSITION OF RAIN FALLING AT ROTHAMSTED.

By E. J. RUSSELL and E. H. RICHARDS.

[Abstracted from *The Journal of Agricultural Science*, London, October, 1919, vol. 9, pp. 309-337.]

Agricultural chemists of the last generation expended a great deal of energy in investigating the problem of whether or not plants could assimilate free nitrogen from the air. An auxiliary problem concerned itself with the source of nitrate and ammonia: Whether they could be supplied in sufficient quantity by the air and rain, or whether artificial supply by fertilizers was necessary. In more recent years the investigation has been continued, not in its original form, but in its relation to atmospheric pollution. The authors of this article have thus investigated the rainfall for Rothamsted for the 10 years following 1905.

The rain water was first studied with respect to the content of ammoniacal nitrogen and then with respect to nitric nitrogen, and it was found that up to 1910 both forms of nitrogen varied in amount directly as the rainfall, the former in about twice as great amounts as the latter. But since 1910, the quantity of nitric nitrogen has appeared to have no simple relationship to the rainfall. The actual amount of ammoniacal nitrogen was about 2.64 pounds per acre, and its monthly fluctuations appear to follow the rainfall closely, being greatest between May and August and least between January and April.

The sources of ammonia are thought to be three, chiefly, the ocean, the soil, and pollution from cities. Since neither the first nor the last seem adequate to account for all the ammonia, the soil itself must generate an appreciable amount. This conclusion appears to be justified because of the direct relation existing between the ammonia content of the soil and biochemical activity. Moreover, the close relationship between ammoniacal and nitric nitrogen suggests either a common origin or the production of nitric compounds from ammonia.

The chlorine content of rain is such as to bring down 16 pounds per acre per year. While there is a close relation between chlorine content and rainfall, there is a decided increase in quantity in the winter months, which is attributed to the transportation of chlorine from the ocean by the gales prevalent during those months. Some of it, however, may come from fuel.

Both chlorine and nitric nitrogen have shown a steady increase from the first measurements in 1888 to the present time. The ammonia content has fallen off. The total of ammoniacal and nitric nitrogen, however, has remained about constant, indicating that perhaps the former source of ammonia is now producing nitric acid. Perhaps the modern gas ranges and grates have produced this effect.

It was found that 66.4 pounds of dissolved oxygen per acre was brought down by rain annually.

The difference of content of winter and summer rain, the former being rich in chlorine and low in nitrogen, and the latter having the relation reversed, makes it seem that the formation of rain during the two seasons differs. Since the winter rain so closely resembles Atlantic rain, it is thought that summer rain may be caused by evaporation of water from the soil and condensation at higher altitudes than in the case of winter rain.—*C. L. M.*

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ATMOSPHERIC POLLUTION.

(Sixth Report of the Committee for the Investigation of Atmospheric Pollution, Meteorological Office, London, 1921.)

[Abstract of review by Alexander McAdie in *Science*, New York, Apr. 22, 1921, pp. 389-391.]

In a previous REVIEW [1] is an abstract of the Fourth Report of the Committee for the Investigation of Atmospheric Pollution containing a detailed analysis of the solids collected in the atmosphere of London, Newcastle, and Malvern, the two latter stations showing, respectively, the greatest and the least amounts of pollution.

In all, 29 gages are in operation, distributed as follows: Birmingham, 3; London, 8; Glasgow, 9; Southport, 2; and 1 each at Kingston, Malvern, Newcastle, Rochdale, Rothamsted, St. Helen's, and Sterling.

The following data are given in this report: (1) Monthly deposits for the two stations representing high and low deposits; (2) total solids deposited monthly at all stations; (3) monthly deposits for summer-half years, i. e., April to September, 1918 and 1919; (4) mean monthly deposits for winter-half years, i. e., October to March, 1918–19, and 1919–20; (5 and 6) classification of stations according to amounts of elements; (7 and 8) totals of classified stations for each element of pollution; (9) comparison of mean monthly deposit during summer and winter; (10) average deposit of each element for each month for two London and four Glasgow stations; also six summaries and analyses.

The table below (somewhat abridged) gives the mean monthly deposits at selected stations.

TABLE 1.—*Mean monthly deposit in metric tons per square kilometer.*

Meteorological office	8.43
Finsbury Park	10.78
Ravenscourt Park	14.09
Southwark Park	15.35
Hasketh Park	6.41
Woodvale Moss	5.34
Malvern	3.17
Bellahouston Park	8.87
Botanic Gardens	10.91
Queens Park	8.01
Richmond Park	12.15

As might be expected the greatest amount of tar deposit occurred in the winter months, when domestic fires are in constant operation. The results of the investigation also seem to indicate that wind plays an important part, high winds sweeping away much of the suspended matter, thus preventing it from being deposited near the source.

Automatic filters holding 24-hour disks were employed. From a large number of records made from these disks in London there appears to be a definite cycle during the 24 hours in the distribution of impurities. Thus from midnight to 6 a. m. the air is practically clear of impurity, very little being recorded except during fogs. At about 6 a. m. when fires are lit, there is an increase until 11 a. m. From 11 a. m. to 10 p. m. there is little variation. After the latter hour, however, there is a rapid decrease to midnight when the minimum period begins.

In considering the feasibility of utilizing standard rain gages in the measurement of solid deposits, the

[1] MONTHLY WEATHER REVIEW, November, 1919, 47: 806-807.